# POTENTIAL URBAN IRRIGATION WATER SOURCES

The philosophy of the RIDS project is to optimize the current irrigation water sources and identify supplemental sources where necessary to meet future demands. In order to meet the demands developed in the previous section, alternative sources of supply must be utilized. Additional allocations from resources that are currently stretched, such as groundwater, will be minimized. Therefore, an inventory of potential sources of supply was conducted to address future irrigation water needs in the study area. These potential sources of supply are:

- Reclaimed wastewater from municipal wastewater treatment plants
- Water recovered during the dry season from reclaimed water aquifer storage and recovery (ASR) systems recharged during the wet season
- Surface water from streams, rivers, abandoned borrow pits, and canal systems having salinity control structures
- Water recovered during the dry season from surface water ASR systems recharged during the wet season
- Groundwater from irrigation supply wells

## Reclaimed Water

In this study, it was assumed that all future wastewater flows would be available for use as reclaimed water. Currently, in many of the involved utilities, surplus water is discharged to surface water or is disposed of through deep well injection. The goal of the RIDS is to have 100% utilization of the effluent water in order to offset the irrigation demand during the dry season. All plant losses and plant water use were assumed to be negligible. Water reclamation facility expansions were taken into account.

The RIDS plans to utilize several reclaimed water interconnects, allowing water to be shared between utilities during times of surplus and deficit. No numbers are displayed to show quantities of water, because the interconnects will be designed to be able to flow in both directions, with actual quantities to be agreed upon by the utilities themselves.

## Reclaimed Water ASR Systems

Reclaimed water ASR is seen to be an integral part of the RIDS. ASR has become increasingly more acceptable and permittable, both from a regulatory and a public awareness standpoint. This is especially true in areas where other supply sources are scarce or lacking. There are several reclaimed water ASR programs that are permitted and in some stage of startup and/or testing in southwest Florida. These include systems for Hillsborough County, City of Englewood, Manatee County, and Collier County. In each case, the recovered water is or will be used in a reuse irrigation system. This technology has also been used for many years as an irrigation source in California. Reclaimed water ASR is developing into one of the more viable options for optimizing existing irrigation water supplies and balancing storage needs.

To determine the amount of the projected irrigation shortfalls that could be met by reclaimed water ASR systems, it was assumed that the mean wet season surplus for each utility would be injected for a period of 120 days and later recovered at a 75% efficiency rate for a period of 180 days. The 75% efficiency factor reflects the loss of some of the injected water through diffusion and dispersion with

the native groundwater in the storage aquifer. In this study it was assumed that the Upper Floridan aquifer, which contains brackish native groundwater, would be used as the storage aquifer. The net result is that the dry season recovery rate would be approximately 50% of the wet season mean injection rate in MGD. The remaining dry season irrigation deficits must be met by other supplemental sources of supply.

A minimum distance of two miles from existing and permitted future municipal reverse osmosis (RO) supply wells and potable water ASR systems was set as a standard siting criteria for potential reclaimed water ASR systems. As some utilities have wastewater treatment plants located in close proximity to RO supply and potable water ASR wells, utilization of reclaimed water ASR would need to be on a semi-regional approach to maximize this resource. The regional approach will be described in some detail later in this document. Table 13 summarizes potential reclaimed water ASR capacities on a subregional basis.

**Table 13**
**Summary of Potential Reclaimed Water ASR Capacity**

| Site | Projected 2020 Capacity (MGD) |
|---|---|
| Naples WWTP/ South Collier/ Marco Island Regional | 7.5 |
| North Collier/Pelican Bay/BSU Regional | 4.0 |
| GES/ Fiesta Village/Ft. Myers Beach Regional | 5.0 |
| Everest & Southwest/Waterway Estates/North Ft. Myers Regional | 2.0 |
| Ft. Myers Central/Ft. Myers South/ Gateway/ Lehigh Acres Regional | 9.0 |

## Surface Water

An inventory was conducted of 25 streams, rivers, and canals located in the study area (Table 14). Figures 14 through 17 display the surface water bodies and major control structures within the study area. Flow data for 22 of the surface water bodies is collected and recorded by either the United States Geological Survey (USGS) or the District. Surface water stage data is available for two of the remaining three surface water bodies. Twenty-two of the 25 surface water bodies inventoried have salinity control structures, which indicates that these water bodies could potentially be used as dry season sources of supply (if flow rates were deemed to be adequate). Available period of record flow data were tabulated and analyzed for each of the surface water bodies. Summaries of these tabulations and analyses are provided in Attachment E.

In a typical year, the four-month period of highest surface water flows occurs from July through October. This represents an approximate one-month delay from the four-month period of highest rainfall (i.e., June through September). Therefore, in the analyses of the surface water flow data for this study, the wet season is considered to be July through October, and the dry season is considered to be the six-month period of December through May. The months of November and June are considered transitional and were not integrated into the statistical analyses.

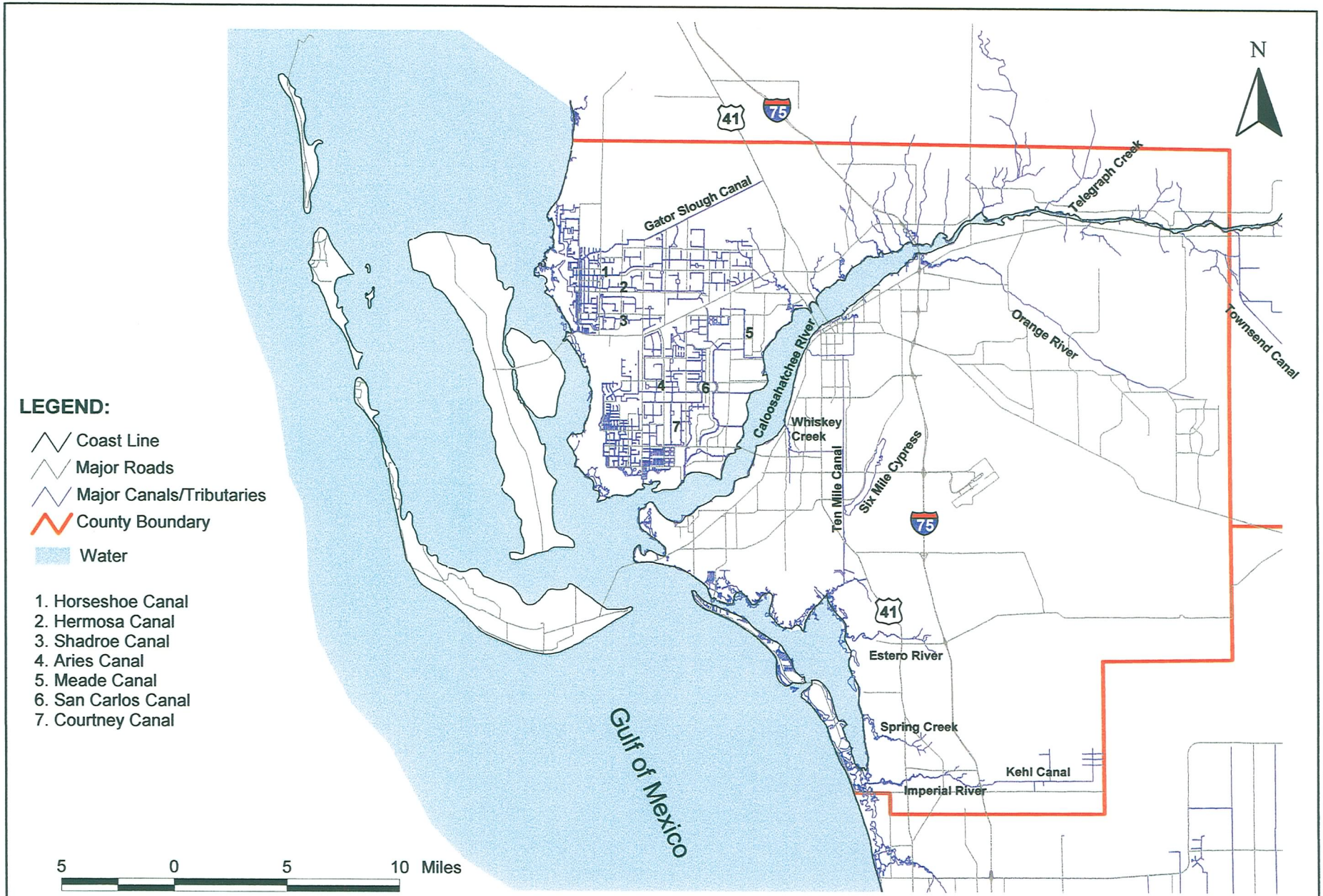
It should be noted that the City of Cape Coral currently utilizes its freshwater canal system as a dry season supplemental irrigation source of supply. This includes Gator Slough and the Aries, Hermosa, Courtney, Horseshoe, Meade, and San Carlos Canals.

## Table 14
## Summary of USGS and SFWMD Stream Flow Data[1]

| Water Body | Gauge Location | Period of Record | Mean Wet Season Flow (MGD) | Mean Dry Season Flow (MGD) | 1-in-10 Year Dry Season Flow (MGD) | Utility Service Area | Comments |
|---|---|---|---|---|---|---|---|
| Caloosahatchee River | S-79 | 1954-2000 | 1550 | 769 | 20 | Lee County Utilities | 1971-96 |
| Golden Gate Canal System | 17th Ave SW | 1965-84 | 208 | 60 | 4 | Collier County Utilities | 1983 |
| Golden Gate Canal System | Airport Rd. | 1964-84 | 394 | 82 | 2 | Collier County Utilities | 1983 |
| Faka Union Slough | 0.5 miles north US 41 | 1978-99 | 342 | 64 | 0 | Collier County Utilities | 1983 |
| Telegraph Creek* | Telegraph Creek Lane | 1997 | 163 | 1 | 0 | Lee County Utilities | WRS, 1998 |
| Cocohatchee River | Willoughby Acres Bridge | 1969-99 | 45 | 7 | 1 | Collier County Utilities | 1983 |
| Imperial River* | Orr Road | 1941-54, 1988-2000 | 146 | 17 | 7 | Bonita Springs Utilities | |
| Henderson Creek Canal | Near US 41 | 1968-99 | 29 | 5 | 0 | Florida Water Ser./CCU | |
| Townsend Canal | SR 80 | 1975-96 | 46 | -33 | -40 | Florida Water Services | 1983/87 |
| Ten Mile Canal | 1.05 miles north of Alico Rd | 1990-98 | 119 | 12 | 3 | LCU/ City of FM | |
| Gator Slough | Near SR 765 | 1984-2000 | 67 | 8 | 0 | City of Cape Coral | |
| Aries Canal | SW 28th St | 1989-2000 | 20 | 3 | 1 | City of Cape Coral | |
| Hermosa Canal | Near SR 765 | 1987-2000 | 26 | 5 | 0 | City of Cape Coral | |
| Estero River* | 1 mile east of US 41 | 1989-2000 | 18 | 2 | | Gulf Envir. Services | |
| Courtney Canal | Mohawk Pkwy | 1986-2000 | 11 | 3 | 0 | City of Cape Coral | |
| Horseshoe Canal | Near SR 765 | 1987-2000 | 31 | 6 | 0 | City of Cape Coral | |
| Six Mile Cypress | Near Ten Mile Canal | 1992-2000 | 38 | 2 | 0 | LCU/ City of Ft. Myers | |
| Shadroe Canal | Embers Pkwy | 1987-2000 | 13 | 3 | 1 | City of Cape Coral | |

| Water Body | Gauge Location | Period of Record | Mean Wet Season Flow (MGD) | Mean Dry Season Flow (MGD) | 1-in-10 Year Dry Season Flow (MGD) | Utility Service Area | Comments |
|---|---|---|---|---|---|---|---|
| Whiskey Creek | Whisky Creek Drive | 1995-2000 | 14 | 3 | 1 | City of Ft. Myers | |
| Spring Creek* | Old US 41 | 1989-2000 | 12 | 2 | 0 | Bonita Springs Utilities | |
| Meade Canal | Viscaya Pkwy | 1986-2000 | 6 | 1 | 0 | City of Cape Coral | |
| San Carlos Canal | SE 26th Terrace | 1986-2000 | 6 | 1 | 0 | City of Cape Coral | |
| Gordon River | SR 886 | 1972-84, 1991-99 | 1 | 1 | 0 | City of Naples | |
| Orange River | Buckingham Road | 1984-99 | | | | Florida Water Services | Stage data only |
| Okaloacoochee Slough | Near Sunniland | 1979-80 | | | | Collier County Utilities | Stage data only |
| Kiehl Canal | | NA | | | | Bonita Springs Utilities | |

[1] Water Year 2000 data unless otherwise specified.
* = No salinity control structure.

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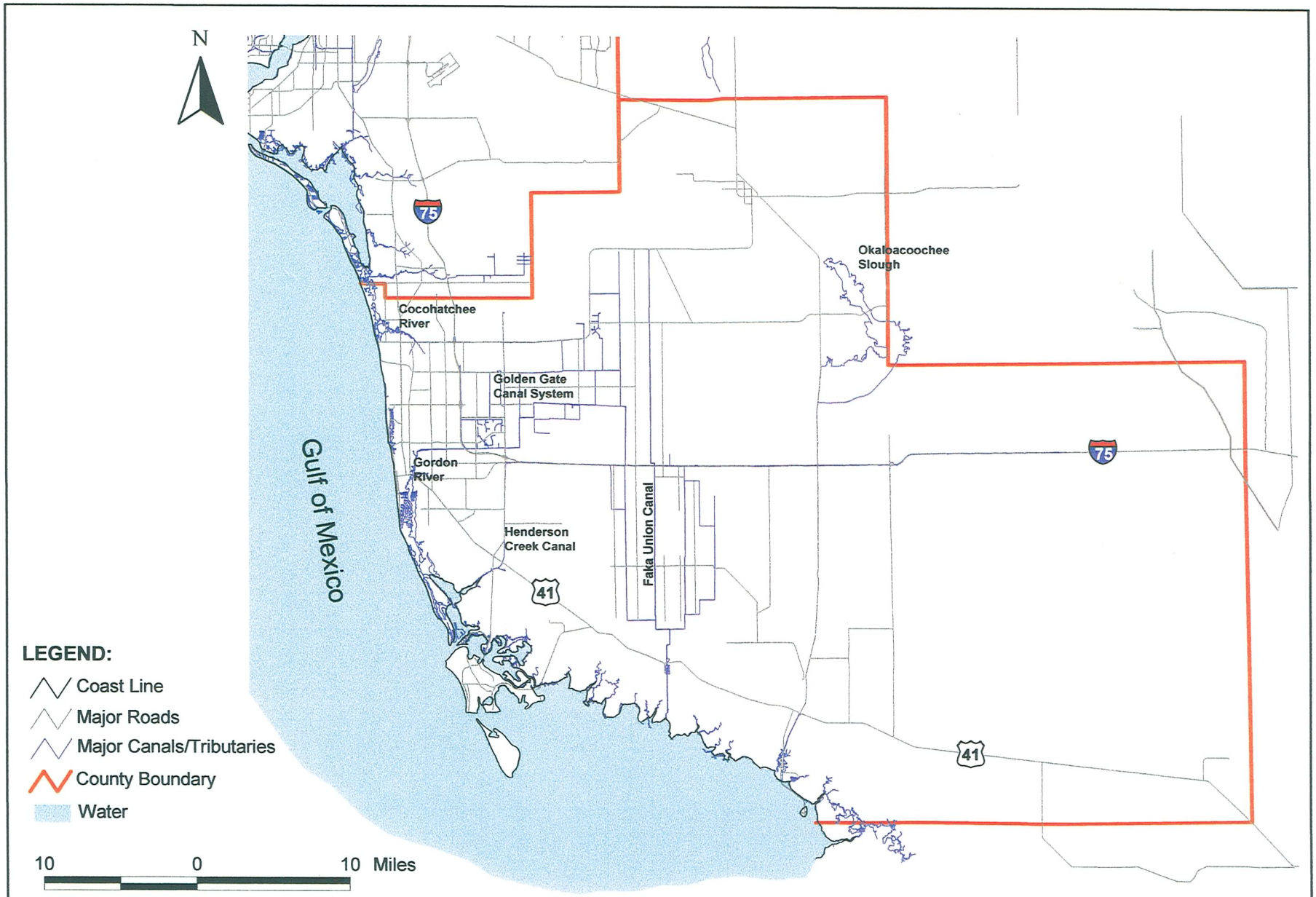
| Master Plan for the Regional Irrigation Distribution System (RIDS) for the Lower West Coast Region | BOYLE | | South Florida Water Management District | MAJOR WATER BODIES - LEE COUNTY | Figure No. 14 |

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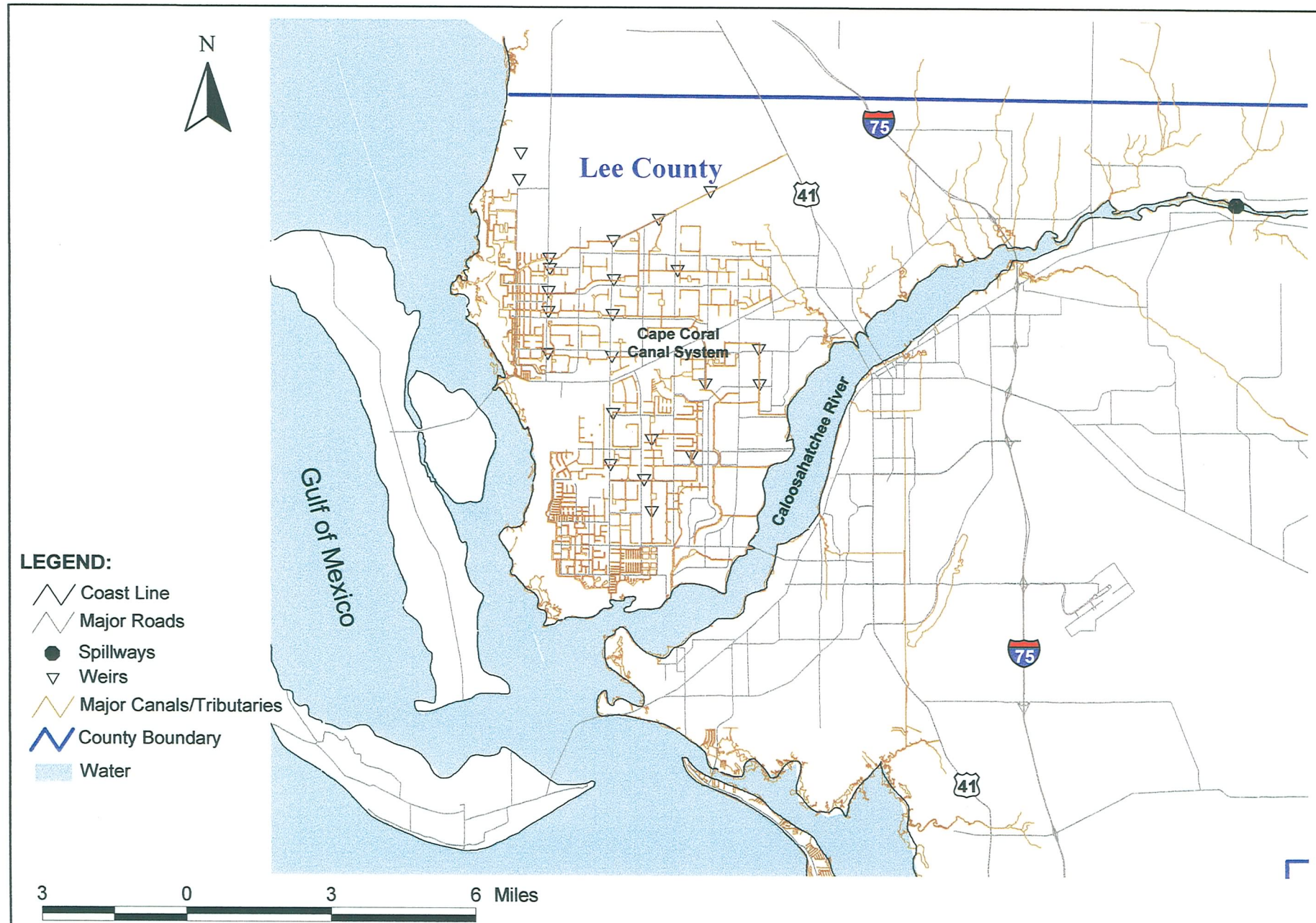
| Master Plan for the Regional Irrigation Distribution System (RIDS) for the Lower West Coast Region | BOYLE | South Florida Water Management District | **MAJOR WATER BODIES - COLLIER COUNTY** | Figure No. 15 |

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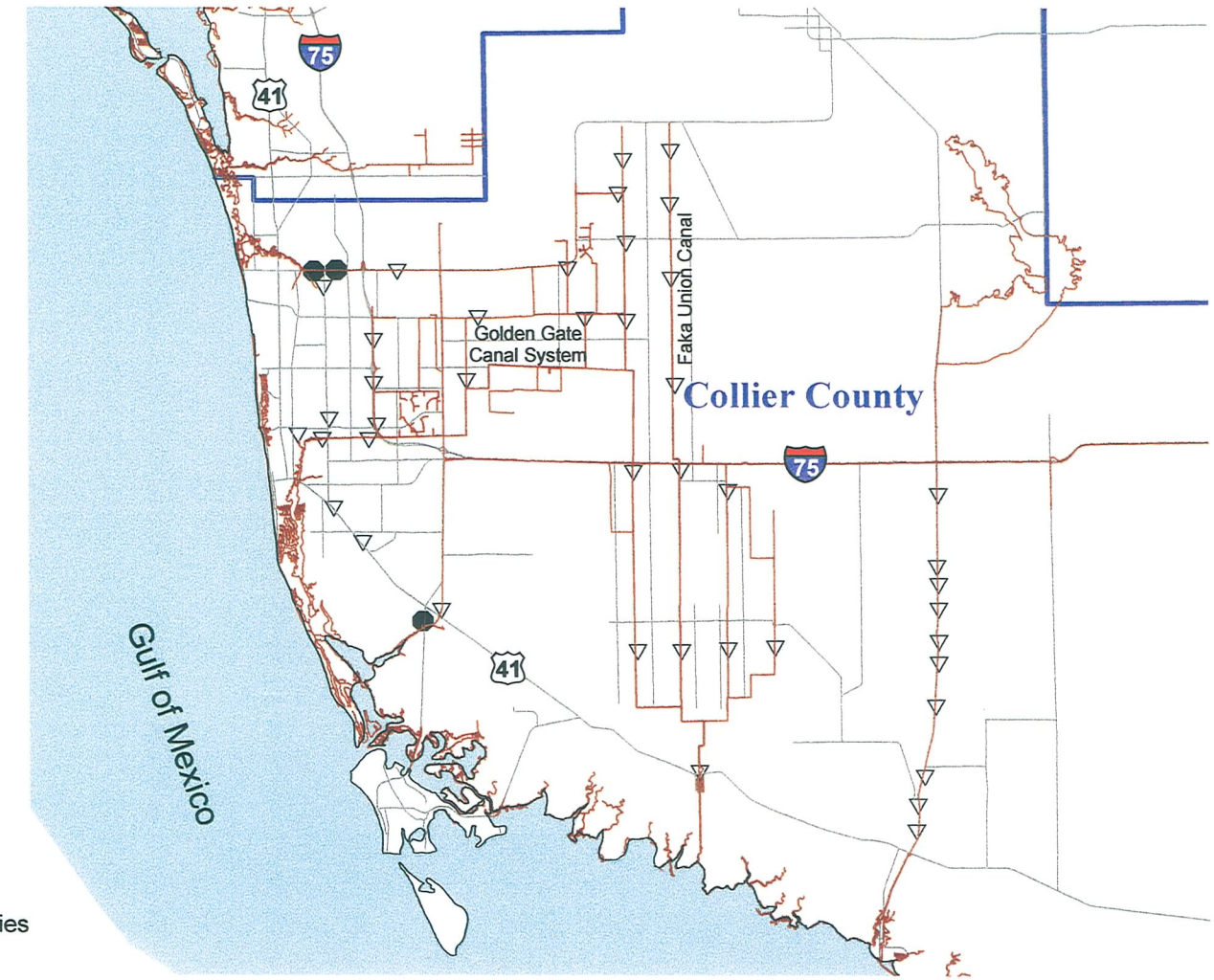
| Master Plan for the Regional Irrigation Distribution System (RIDS) for the Lower West Coast Region | BOYLE | South Florida Water Management District | SURFACE WATER RESOURCES STRUCTURES - LEE COUNTY | Figure No. 16 |




**LEGEND:**

- Coast Line
- Major Roads
- Spillways
- Weirs
- Major Canals/Tributaries
- County Boundary
- Water

10 0 10 Miles

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| Master Plan for the Regional Irrigation Distribution System (RIDS) for the Lower West Coast Region | BOYLE | | South Florida Water Management District | SURFACE WATER RESOURCES STRUCTURES - COLLIER COUNTY | Figure No. 17 |

The current permitted withdrawal rate from this source is approximately 28 MGD. Ongoing improvements to the control structures for this system will provide an incremental future increase in permitted withdrawal capacity. Measured dry season flow rates in the canal system have been influenced by these withdrawals since the City's reuse system became operational in 1994.

In order to evaluate the potential use of other surface water systems, a mean dry season flow rate of at least 20 MGD was set as a limiting factor. This would provide for 2 MGD if a 10% diversion rate for irrigation purposes could be permitted. The remaining 90% of flow would continue to support environmental needs. Based on these evaluation criteria, only two surface water bodies have the potential for use as dry season sources of supply. These are the Golden Gate Canal system and the Faka Union Canal system. Furthermore, drought condition flow evaluations indicate that the Golden Gate and Faka Union Canal systems would not be reliable sources during 1-in-10 year drought events. While the Caloosahatchee was originally looked upon favorably as an irrigation water source, the District has indicated that surface water from the Caloosahatchee River shall not be considered as a potential dry season supplemental water source for the RIDS because of the CERP and ongoing shortages.

**Surface Water ASR Systems**

In order to provide drought condition reliability for surface water sources of supply and also to provide a more efficient use of surface water bodies that have mean dry season flows of less than 20 MGD, surface water ASR systems are another essential part of the RIDS project. The concept of using surface water as a source to recharge an ASR system and then withdrawing that stored water for use in irrigation systems is increasingly gaining acceptance.

The main criterion for narrowing the analysis was a mean wet season flow of 20 MGD or greater, utilizing a diversion rate of 20% to a surface water ASR system. It was determined that 8 of the 25 surface water bodies would be available for use in a surface water ASR system without a detrimental effect on the environment. These are identified in Table 15. The storage aquifer for the potential surface water ASR systems was assumed to be the Upper Floridan aquifer.

Surface water ASR is currently being used at the Marco Lakes site, which Florida Water Services uses as a potable water supply source for Marco Island in Collier County. That system diverts a small percentage of the wet season flow from Henderson Creek to ASR wells via the Lakes. A surface water ASR system is also currently under development for the City of North Port. This system will divert a small percentage of the wet season flow from the Myakkahatchee Creek for subsurface storage, and later withdrawal, for potable purposes after treatment.

As surface water ASR is currently used in southwest Florida as a potable source, it follows that recovered water use for irrigation would be suitable and will not be constrained by such stringent water quality criteria. It should be noted that surface water ASR is the main component contemplated to meet water supply demands for the CERP.

Prior to injection of surface water into an ASR system, it is anticipated that filtration and disinfection will be needed in order meet applicable water quality standards. The cost for these types of treatment systems is included in the estimated costs for the surface water ASR systems. Water quality exemptions (minor) for certain secondary parameters (e.g., color) may be required for some sources.

It is anticipated that the recovered water from these surface water ASR systems will meet the regulatory criteria of FAC 62-610.472.

Telegraph Creek was not included due to the fact that only one year of partial flow data is available for that stream. The storage aquifer for the potential surface water ASR systems was again (as in the case of reclaimed water ASR systems) assumed to be the Upper Floridan aquifer.

A minimum distance of two miles from existing and permitted future municipal reverse osmosis (RO) supply wells and potable water ASR systems was used in the site selection process. In most cases the location selected for a surface water ASR system was adjacent to a control structure.

**Table 15**
**Summary of Potential Surface Water ASR Systems**

| Irrigation Supply Source | Pumping Station Location | Dry Season ASR Recovery (MGD)[2] | Average Dry Season Surface Water Flow (MGD)[3] | Utility Service Area |
|---|---|---|---|---|
| Caloosahatchee River | S-79 | 155[1] | 77[1] | Lee County Utilities (LCU) |
| Golden Gate Canal System | 17th Ave SW | 21 | 6 | Collier County Utilities (CCU) |
| Golden Gate Canal System | Airport Rd. | 39 | 8 | CCU |
| Faka Union Slough | 0.5 miles north US 41 | 34 | 6 | CCU |
| Cocohatchee River | Willoughby Acres Bridge | 5 | 1 | CCU |
| Imperial River* | Orr Road | 15 | 1 | Bonita Springs Utilities |
| Henderson Creek Canal | Near US 41 | 3[1] | 2[1] | Florida Water Ser./CCU |
| Ten Mile Canal | 1.05 mi north of Alico Rd | 12 | - | LCU/ City of Ft. Myers |
| Gator Slough | Near SR 765 | 7 | 0.8[1] | City of Cape Coral (CC) |
| Hermosa Canal | Near SR 765 | 3 | 0.3[1] | CC |
| Horseshoe Canal | Near SR 765 | 3 | 0.3[1] | CC |

[1] Source currently being used for municipal potable or reuse system.
[2] Based on 20% diversion of wet season surface water flow to ASR system for 120 days and 75% recovery efficiency for 180 days.
[3] Based on 10% diversion of dry season surface water flow.
* = No salinity control structure.

## Existing Potable Water Supply Facilities

The locations of existing potable water infrastructure including treatment plants, wellfields, surface water intakes and potable water ASR wells were determined. Figures 18 and 19 present the existing potable water infrastructure facilities for Lee and Collier counties, respectively.

## Groundwater

Groundwater is currently used as a supplemental irrigation source for reuse water by both the City of Cape Coral and by Collier County Utilities. The City of Cape Coral utilizes horizontal wells constructed in the water-table aquifer to supplement its reuse and freshwater canal sources. Collier County utilizes Lower Tamiami aquifer wells at its Pelican Bay wellfield and is currently designing water-table aquifer wells at Mule Pen Quarry to supplement its reuse system. The

potential future use of water-table aquifer horizontal well systems located in road rights-of-way is a feasible alternative.

In the future, potential may exist for utilizing surficial aquifer horizontal wells as a supplemental RIDS source in selected locations. Also, horizontal wells constructed at select golf courses and other locations could be utilized as an injection water source for Floridan aquifer ASR wells. This would serve to more efficiently utilize a resource that would otherwise be pumped from wet areas and stormwater systems, and ultimately be discharged to tidal water bodies during the wet season. While this may be a feasible option at a later time, further evaluation of horizontal wells is not included as part of this study. It is important to note that the District will likely discourage the future use of vertical wells withdrawing from freshwater aquifers to provide supplemental water for irrigation purposes.

It may be possible, however to obtain supplemental water for reclaimed systems through adjacent wells from other mine pits that have ceased active mining operations. Four additional mining operations have been identified in the study area, and have been determined to be in excellent locations for withdrawal.

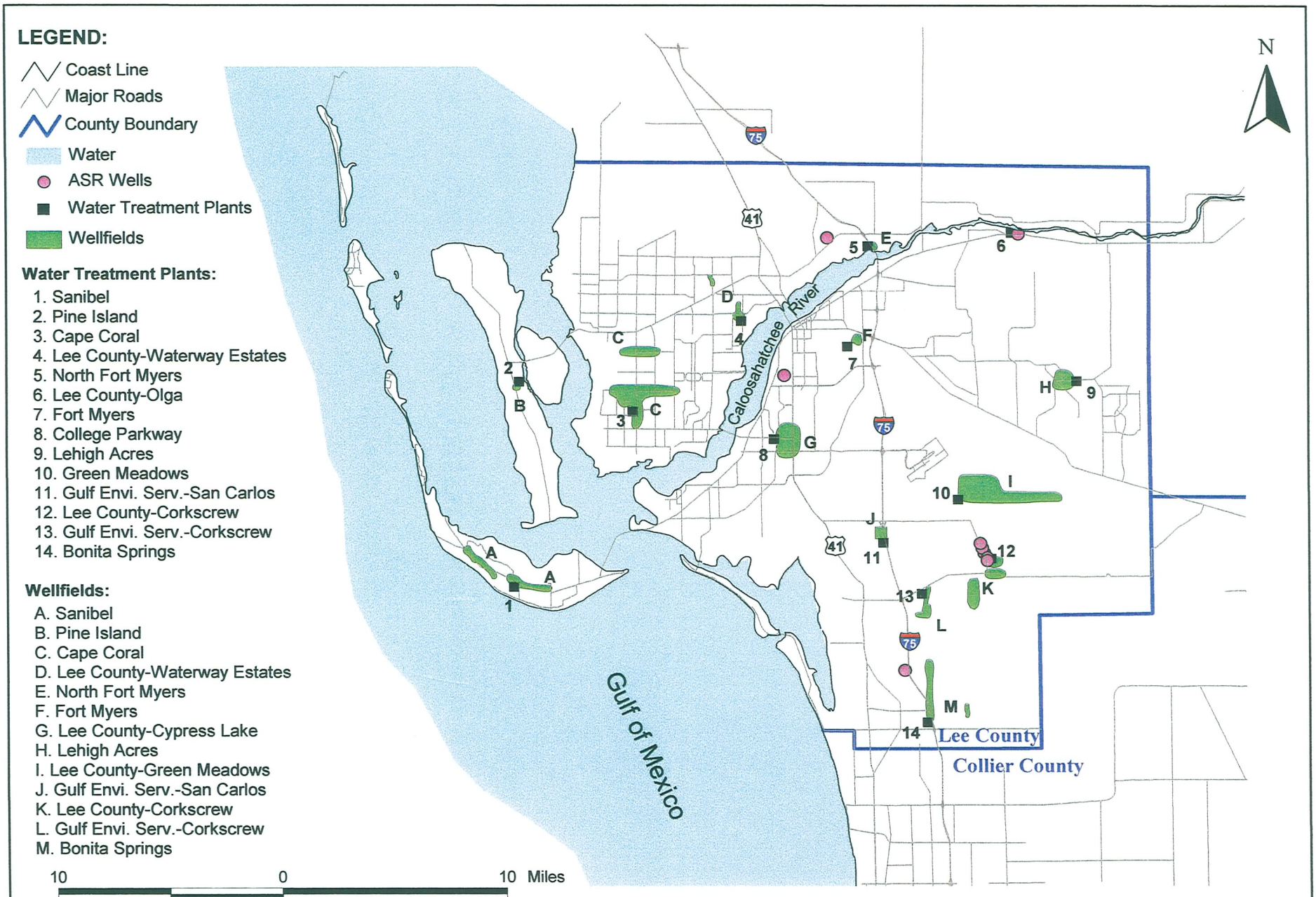
These are summarized on Table 16, and the locations of these operations are shown on Figures 20 and 21.

In the usual course of development, after mine pits have been fully utilized to extract aggregates, they are commonly integrated in planned residential/golf course developments as aesthetic amenities. Examples of this are Miromar Lakes in Lee County and Heritage Bay in Collier County. The existing lakes also commonly serve as irrigation water sources for the new developments. With this in mind, as well as the fact that the water use permit allocations for the active mines are mostly for recirculated water and not for water that is actually lost from a site, the estimated volume of water that could be used to supplement the RIDS was estimated at 25% of the current mine permit allocation.

**Table 16**
**Summary of Mine Pits That May Have Future Potential as Supplemental Water Supplies**

| Permit # | Permittee | Location | Mine Name | Current Allocation (MGD) | Estimated Useable Future Withdrawal (MGD) |
|---|---|---|---|---|---|
| 08-00008-W | Coral Rock Ind. | Sec. 26-42S-25E | Limerock | 3.24 | 0.8 |
| 08-00011-W | Ajax Paving | Sec. 23,24-42S-25E | Jay Rock | 3.24 | 0.8 |
| 08-00045-W | Babcock Florida | Sec. 25-42S-25E | Babcock | 7.2 | 1.8 |
| 11-00039-W | Florida Rock | Sec. 13-48S-26E | Mule Pen | 5.04 | 0.0[1] |
| 11-00256-W | Ashland Oil | Sec. 16-49S-27E | Golden Gate | 6 | 1.5 |
| | | | **Totals:** | **56.75** | **12.9** |

[1] This source is already permitted to provide supplemental water for Collier County's reuse system.

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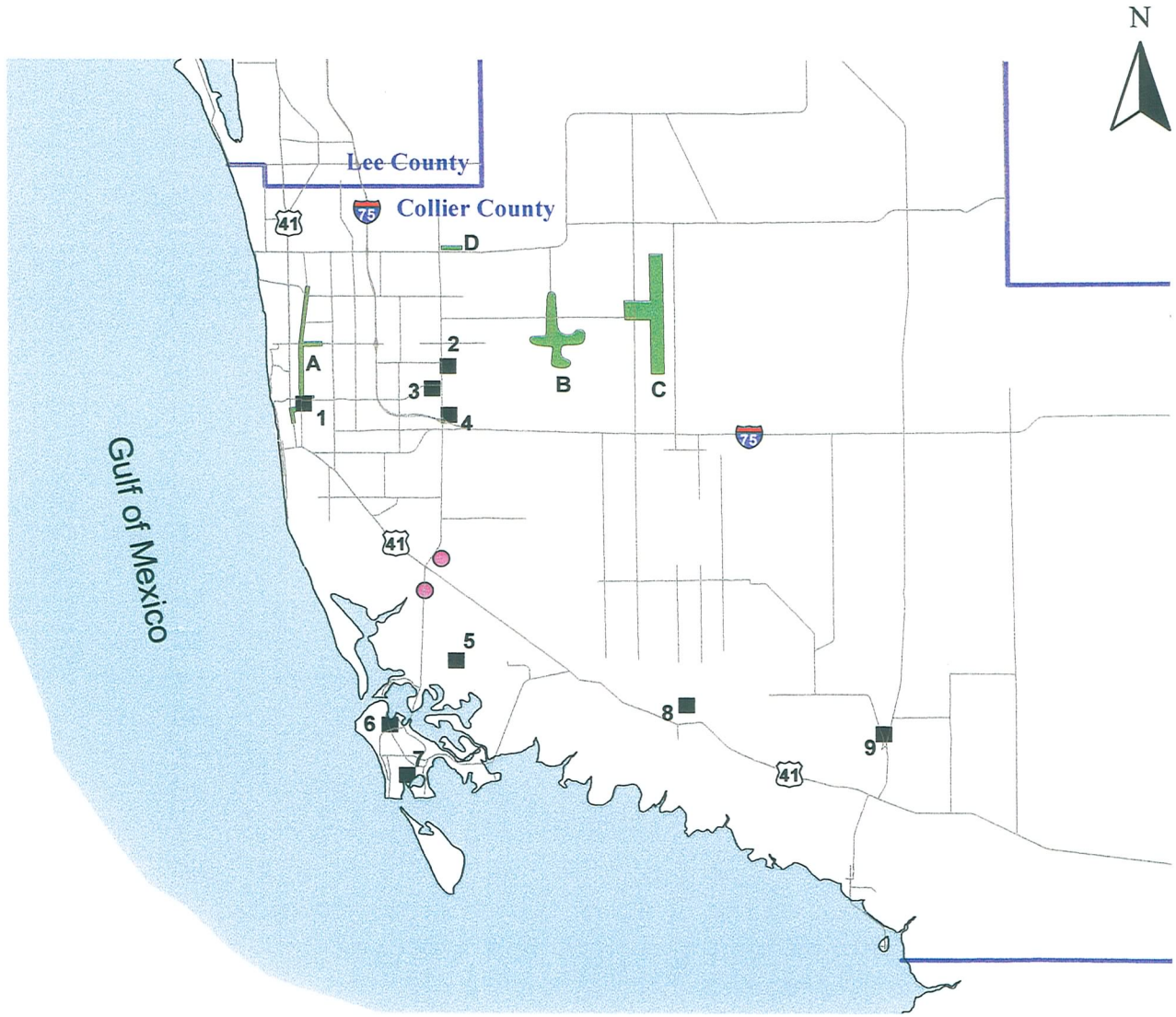
| Master Plan for the Regional Irrigation Distribution System (RIDS) for the Lower West Coast Region | BOYLE | South Florida Water Management District | EXISTING WATER SUPPLY, WELLFIELD AND ASR LOCATIONS IN LEE COUNTY | Figure No. 18 |




**LEGEND:**

- Coast Line
- Major Roads
- County Boundary
- Water
- ASR Wells
- Water Treatment Plants
- Wellfields

**Water Treatment Plants:**

1. Naples
2. Collier County North
3. Golden Gate
4. Collier County South
5. Marco Shores
6. Marco Island LSP
7. Marco Island ROP
8. Port of the Isles
9. Everglades City

**Wellfields:**

A. Naples Coastal Ridge
B. Collier East Golden Gate
C. Naples East Golden Gate
D. Immokalee

10 0 10 Miles

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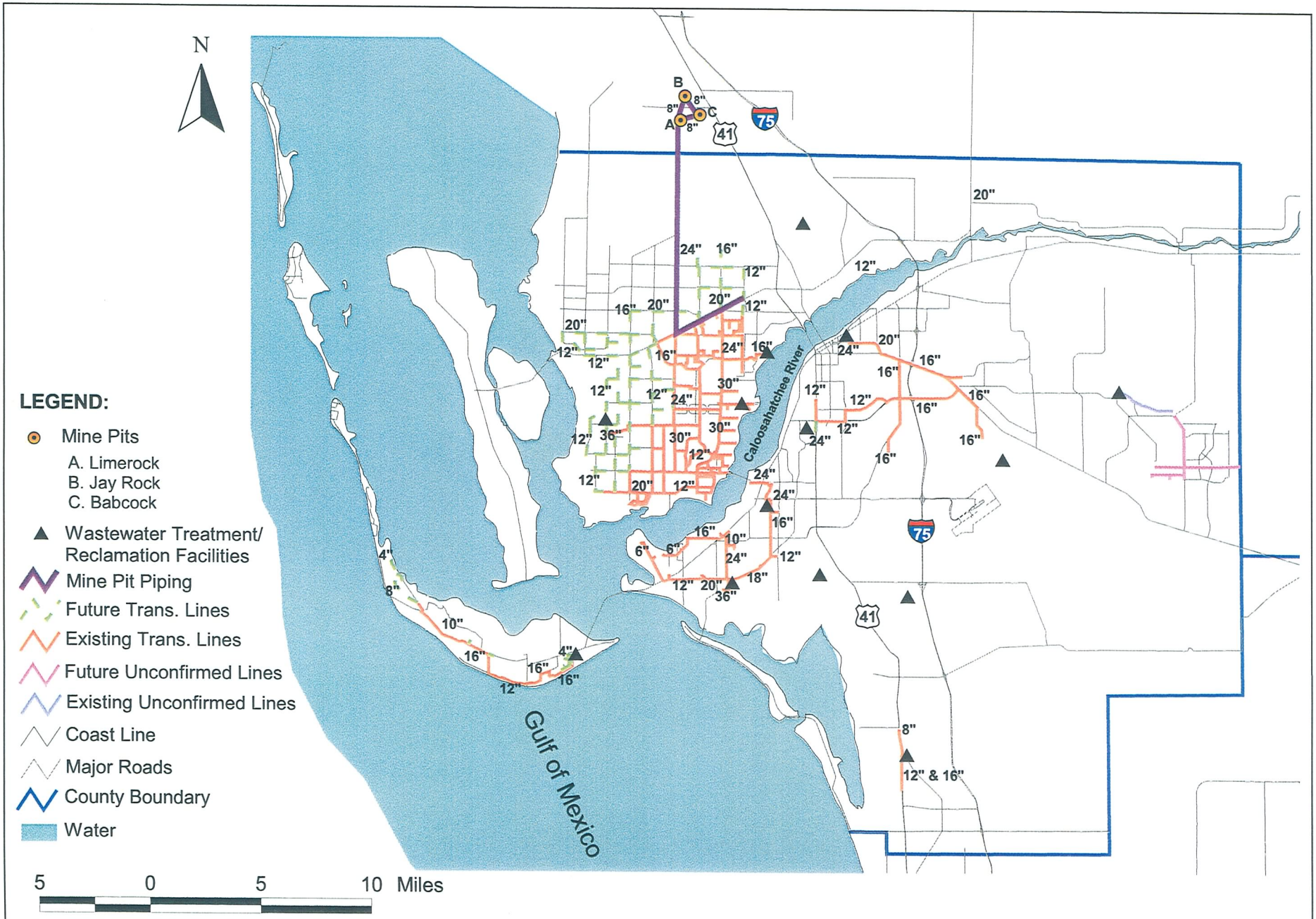
| Master Plan for the Regional Irrigation Distribution System (RIDS) for the Lower West Coast Region | BOYLE | South Florida Water Management District | EXISTING WATER SUPPLY, WELLFIELD AND ASR LOCATIONS IN COLLIER COUNTY | Figure No. 19 |

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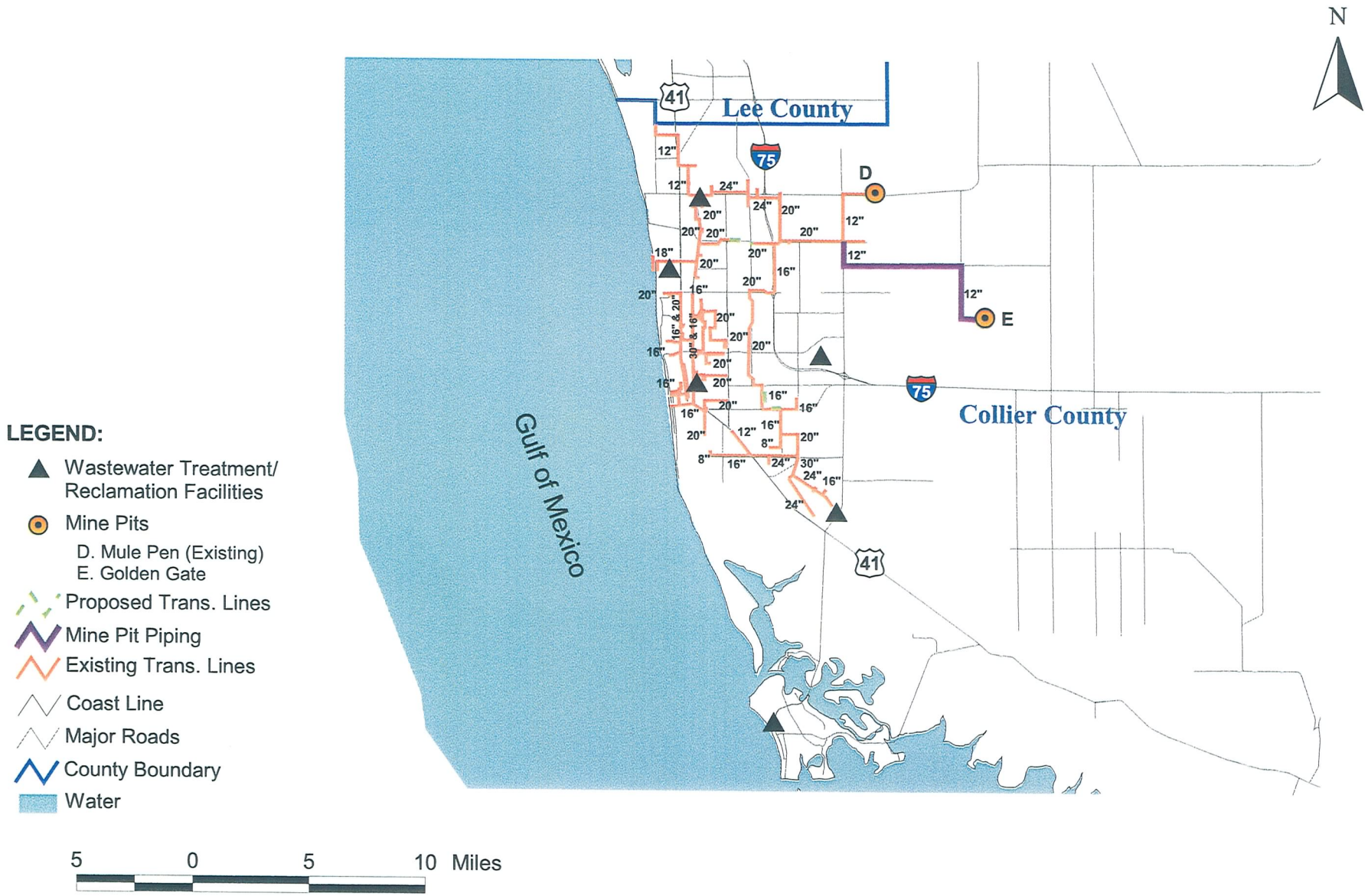
| Master Plan for the Regional Irrigation Distribution System (RIDS) for the Lower West Coast Region | BOYLE | South Florida Water Management District | MINE PIT LOCATIONS AND PIPING - LEE COUNTY | Figure 20 |

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| Master Plan for the Regional Irrigation Distribution System (RIDS) for the Lower West Coast Region | BOYLE | South Florida Water Management District | MINE PIT LOCATIONS AND PIPING - COLLIER COUNTY | Figure 21 |